

WHAT IS CLAIMED IS:

1. A working control device comprising:
 - a configuration characteristic extraction unit
 - 5 obtaining configuration information about characteristics of a three-dimensional configuration from design data of an object workpiece;
 - a working case storage unit storing working conditions, as a working case, of the working
 - 10 conducted in the past;
 - a case searching unit searching out the working case from the working case storage unit on the basis of the configuration information;
 - a working condition setting unit determining
 - 15 the working conditions based on the working case searched out by the case searching unit; and
 - a control unit controlling a working machine on the basis of the working conditions.
2. A working control device according to Claim
- 20 1, further comprising:
 - a judgment criterion storage unit stored with information serving as a judgment criterion for the working conditions,
 - wherein the working condition setting unit
 - 25 determines the working conditions based on the information of the judgment criterion storage unit and on the working case searched out by the case

searching unit.

3. A working control device according to Claim 1, further comprising:

a pre-working input unit accepting an input of information about the object workpiece, wherein the working condition setting unit determines the working conditions based on the information given from the pre-working input unit and on the design data.

10 4. A working control device according to Claim 1, further comprising:

a monitoring unit obtaining information of the working machine when the control unit controls based on the working conditions; and

15 a working case registration unit having the working case storage unit stored with the working machine information obtained by the monitoring unit in a way that makes it as a working case mapping to the configuration information.

20 5. A working control device according to Claim 1, further comprising:

a monitoring unit obtaining information of the working machine when the control unit controls based on the working conditions;

25 a working case registration unit having the working case storage unit stored with the working machine information obtained by the monitoring unit

in a way that makes it as a working case mapping to the configuration information; and

a post-working input unit accepting an input of information about whether the working is preferable
5 or not,

wherein the working case registration unit has the working case storage unit stored with the working case, corresponding to the information accepted by the post-working input unit.

10 6. A working control device according to Claim 1, wherein the configuration characteristic extraction unit divides a surface of the object workpiece represented by the design data into polygons, obtains coordinates of vertexes of these
15 polygons as X-, Y- and Z-values in the case of being expressed by values in X-, Y- and Z-direction, obtains minimum and maximum X-values, minimum and maximum Y-values and minimum and maximum Z-values among all the vertexes, obtains a maximum X-axis
20 directional length by subtracting the minimum X-value from the maximum X-value, obtains a maximum Y-axis directional length by subtracting the minimum Y-value from the maximum Y-value, and obtains a maximum Z-axis directional length by subtracting the minimum Z-
25 value from the maximum Z-value.

7. A working control device according to Claim 6, wherein the configuration characteristic

extraction unit projects all the polygons onto an X-Y plane on which a lowermost part of the object workpiece is positioned, obtains a volume of a polygon pole created by connecting respectively the vertexes of each polygon to corresponding vertexes of the polygon projected onto the X-Y plane, obtains a volume of the object workpiece by repeating this calculation with respect to all the polygons, and obtains a removal volume by subtracting this from a volume obtained by multiplying the maximum X-axis directional length, the maximum Y-axis directional length and the maximum Z-axis directional length.

8. A working control device according to Claim 1, wherein the configuration characteristic extraction unit judges whether a normal line of the polygon is parallel with a working axis or not, and classifies the polygon exhibiting the parallelism according to a value in the Z-axis direction.

9. A working control device according to Claim 1, wherein the configuration characteristic extraction unit extracts concave shape parts of the object workpiece represented by the design data, and obtains a concave shape radius dimension having a minimum radius in the concave shape parts.

10. A working control device according to Claim 1, wherein the configuration characteristic extraction unit extracts concave shape parts of the

object workpiece represented by the design data,
classifies the concave shape parts according to a
radius dimension, obtains an areal size of the
concave shape part according to this radius dimension,
5 and obtains a radius dimension having a maximum areal
size.

11. A working control device according to Claim
1, wherein the configuration characteristic
extraction unit divides a surface of the object
10 workpiece represented by the design data into
polygons, compares, in the case of representing the
coordinates of the vertexes of these polygons in
values in the X- Y- and Z-directions, Z-axis values
of the vertexes of the polygons excluding the
15 polygons having fitting surfaces to the working
machine and the polygons abutting on these fitting
surfaces, and obtains a minimum Z-axis value as a
maximum depth of the object workpiece.

12. A working control device according to Claim.
20 1, wherein the configuration characteristic
extraction unit divides a surface of the object
workpiece represented by the design data into
polygons, judges whether or not a normal line of the
polygon is parallel with the working axis, classifies
25 the polygons into the polygons exhibiting the
parallelism and the polygons exhibiting no
parallelism, obtains a working range by grouping the

polygons including shared edges with respect to each classification, and obtains the edges, as a working range boundary line, which are not shared with other polygons in each group.

5 13. A working control device according to Claim 1, wherein the configuration characteristic extraction unit obtains blank dimensions by adding a working margin in the working case searched out by the case searching unit to the maximum X-axis
10 directional length, the maximum Y-axis directional length and the maximum Z-axis directional length.

 14. A working control device according to Claim 1, further comprising:

 a monitoring unit obtaining information of the
15 working machine when the control unit performs the control based on the working conditions;

 a post-working input unit accepting an input of information about whether a result of the working is preferable or not when performing the control; and

20 a working case registration unit having the working case storage unit stored with the working machine information obtained by the monitoring unit and information about whether a result of the working is preferable or not in a way that makes it as a
25 working case mapping to the configuration information,
 wherein in case the result of the working in the working case searched out by the case searching

unit is preferable, the working condition setting unit determines the working conditions based on the working case.

15. A working control device according to Claim 5 1, wherein the case searching unit searches the working case database by using the configuration information obtained from the configuration characteristic extraction unit as a search key, and thus searches out a working case mapping to the 10 configuration information falling within a predetermined range.

16. A working control device according to Claim 1, wherein the working machine is a cutting machine, the monitoring unit measures a main shaft load 15 state of the working machine, and

the control unit, in case the measured main shaft load is out of a predetermined range, adjusts a feeding speed of the cutting machine so as to fall within the predetermined range.

20 17. A working control device according to Claim 1, wherein the working machine is a cutting machine, the monitoring unit measures a main shaft load state of the working machine, and

the control unit, in case the measured main 25 shaft load is out of a predetermined range, adjusts a the number of revolutions of the main shaft of the cutting machine so as to fall within the

predetermined range.

18. A working control device according to Claim 1, wherein in the case of using a plurality of tools, the working condition setting unit compares a cutting residual quantity of the tool to be used ahead with an allowable range of the tool to be used next, and, if the cutting residual quantity of the tool to be used ahead exceeds the allowable range of the next tool, sets so that the cutting residual quantity of the tool to be used head falls within the allowable range of the next tool by changing, adding or deleting the tool.

19. A working control device according to Claim 1, wherein in the case of using a plurality of tools, the working condition setting unit compares a cutting residual quantity of the tool to be used ahead with an allowable range of the tool to be used next, adds a tool used between the tool to be used ahead and the tool to be used next if the cutting residual quantity of the tool to be used ahead is over an upper limit of the allowable range of the next tool, compares the cutting residual quantity of the tool to be used ahead with the allowable range of the tool to be used next if the cutting residual quantity of the tool to be used ahead is under a lower limit of the allowable range of the next tool, and deletes the tool to be used next if the cutting residual quantity of the

tool to be used ahead is within the allowable range of the tool to be used next.

20. A working control program for making a computer execute steps of:

5 obtaining configuration information about characteristics of a three-dimensional configuration from design data of an object workpiece;

 searching out a working case on the basis of the configuration information from a working case
10 storage unit storing working conditions, as a working case, of the working conducted in the past;

 determining the working conditions based on the working case; and

 controlling a working machine on the basis of
15 the working conditions.

21. A working control system comprising a working machine and a working control device for controlling the working machine,

 the working control device including:

20 a configuration characteristic extraction unit obtaining configuration information about characteristics of a three-dimensional configuration from design data of an object workpiece;

 a working case storage unit storing working
25 conditions, as a working case, of the working conducted in the past;

 a case searching unit searching out the working

case from the working case storage unit on the basis of the configuration information;

a working condition setting unit determining the working conditions based on the working case searched out by the case searching unit; and

a control unit controlling a working machine on the basis of the working conditions.

22. A working control device according to Claim 1, further comprising a judgment criterion storage unit having a tool library stored with information of usable tools,

wherein the working condition setting unit determines a minimum tool diameter necessary for the cutting/working on the basis of the design data and the usable tool information, determines a target time T of the cutting/working on the basis of the working case searched out by the case searching unit, adds the tools in sequence from the tool having the minimum tool diameter, calculates a time T_n in the case of effecting the cutting/working with the tools inclusive of an n -th tool, repeats a process of calculating the time T_n by adding the tools till the time T_n becomes shorter than the target time T , and determines the using tool from among the n -pieces of tools at a point of time when the time T_n becomes shorter than the target time.

23. A working control device according to Claim

1, further comprising a judgment criterion storage unit having a tool library stored with information of usable tools,

wherein the working condition setting unit
5 determines a minimum tool diameter necessary for the cutting/working on the basis of the design data and the usable tool information, adds the tools in sequence from the tool having the minimum tool diameter, calculates a time T_n in the case of
10 effecting the cutting/working with the tools inclusive of an n -th tool, repeats a process of calculating the time T_n by adding the tools till the time T_n becomes shorter by a predetermined value than a time T_{n-1} in the case of effecting the
15 cutting/working with the tool inclusive of an $(n-1)$ th tool, and determines the using tool from among the $(n-1)$ -pieces of tools at a point of time when the time T_n does not become shorter by the predetermined value than the time T_{n-1} .

20 24. A tool determining method based on a working control device comprising a configuration characteristic extraction unit obtaining configuration information about characteristics of a three-dimensional configuration from design data of
25 an object workpiece, a judgment criterion storage unit including a tool library stored with information of usable tools, a working case storage unit storing

working conditions, as a working case, of the working
conducted in the past, a case searching unit
searching out the working case from the working case
storage unit on the basis of the configuration
5 information, a working condition setting unit
determining the working conditions based on the
working case searched out by the case searching unit,
and a control unit controlling a working machine on
the basis of the working conditions,
10 the working condition setting unit executing
steps of:
determining a minimum tool diameter necessary
for the cutting/working on the basis of the design
data and the usable tool information;
15 determining a target time T of the
cutting/working on the basis of the working case
searched out by the case searching unit;
adding the tools in sequence from the tool
having the minimum tool diameter and calculating a
20 time T_n in the case of effecting the cutting/working
with the tools inclusive of an n -th tool;
comparing the time T_n with the target time T
and repeating a step of calculating the time T_n by
adding the tools till the time T_n becomes shorter
25 than the target time T ; and
determining the using tool from among the n -
pieces of tools at a point of time when the time T_n

becomes shorter than the target time.

25. A tool determining method based on a
working control device comprising a configuration
characteristic extraction unit obtaining
5 configuration information about characteristics of a
three-dimensional configuration from design data of
an object workpiece, a judgment criterion storage
unit including a tool library stored with information
of usable tools, a working case storage unit storing
10 working conditions, as a working case, of the working
conducted in the past, a case searching unit
searching out the working case from the working case
storage unit on the basis of the configuration
information, a working condition setting unit
15 determining the working conditions based on the
working case searched out by the case searching unit,
and a control unit controlling a working machine on
the basis of the working conditions,

the working condition setting unit executing:
20 a step of determines a minimum tool diameter
necessary for the cutting/working on the basis of the
design data and the usable tool information;

a step of adding the tools in sequence from the
tool having the minimum tool diameter and calculating
25 a time T_n in the case of effecting the
cutting/working with the tools inclusive of an n-th
tool;

a step of comparing a time T_{n-1} in the case of effecting the cutting/working with the tools inclusive of an $(n-1)$ th tool with the time T_n , and repeating a process of calculating the time T_n by
5 adding the tools in case the time T_n becomes shorter by a predetermined value or above than the time T_{n-1} ; and

a step of determining the using tool from among the $(n-1)$ -pieces of tools at a point of time when the
10 time T_n does not become shorter by the predetermined value or above than the time T_{n-1} .

26. A tool determining program for making a computer comprising a configuration characteristic extraction unit obtaining configuration information
15 about characteristics of a three-dimensional configuration from design data of an object workpiece, a judgment criterion storage unit including a tool library stored with information of usable tools, a working case storage unit storing working conditions,
20 as a working case, of the working conducted in the past, a case searching unit searching out the working case from the working case storage unit on the basis of the configuration information, a working condition setting unit determining the working conditions based
25 on the working case searched out by the case searching unit, and a control unit controlling a working machine on the basis of the working

conditions, execute steps of:

determining a minimum tool diameter necessary for the cutting/working on the basis of the design data and the usable tool information;

5 determining a target time T of the cutting/working on the basis of the working case searched out by the case searching unit;

adding the tools in sequence from the tool having the minimum tool diameter and calculating a
10 time T_n in the case of effecting the cutting/working with the tools inclusive of an n -th tool;

comparing the time T_n with the target time T and repeating a step* of calculating the time T_n by adding the tools till the time T_n becomes shorter
15 than the target time T ; and

determining the using tool from among the n -pieces of tools at a point of time when the time T_n becomes shorter than the target time.

In the invention, the above components can be
20 combined to the greatest possible degree.